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ABSTRACT

In-service training of elementary school science teachers, the topic of the United States-Japan Joint Science Seminar held in Kyoto and Tokyo, Japan in 1975, is presented. Program innovations and their relationship to in-service education in the United States and Japan are discussed. The role of Japanese science centers and schools is included in the discussion of curriculum development and innovative changes needed for elementary science programs. (Author/SA)

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ADVANCING EDUCATION THROUGH SCIENCE-ORIENTED PROGRAMS, Report PSc-14

In-Service Training of Elementary School Science Teachers

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IN-SERVICE TRAINING OF ELEMENTARY SCHOOL SCIENCE TEACHERS

A U.S. - Japan Joint Seminar

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Introduction

The in-service training of elementary-school science teachers was the topic of a U.S. - Japan Joint Science Seminar held in Kyoto and Tokyo, Japan from October 13 to 17, 1975. The seminar was co-sponsored by the Japan Society for Promotion of Science (JSPS) and the U.S. National Science Foundation (NSF). It was held under the terms of the United States-Japan Bi-national Science Agreement. The goal of the conference was an interchange of ideas regarding the current practice, anticipated needs, and future plans for in-service education of teachers of elementary science in both countries. The elementary schools in both countries are responsible for the general education of all the children. The individuals who teach elementary science tend not to be specialists in science. Therefore, it became clear that the conference was really using science education as the focus for discussing the nature of education and schooling for young people. Since the teachers are not specialists in science but teach all subjects, efforts to improve the quality of science teaching are efforts to improve the quality of teaching in general.

In discussing the importance of elementary education in general and elementary science education in particular, Professor Suteo Goto, Dean of Tokyo Gakugei University and conference organizer for Japan, made the following

points:

1. Transmitting the values and accomplishments of the culture in a way that will inspire the creative power of the children is the overall goal of education.

2. Recent innovation in elementary-school science in both the United States and Japan has led to improvements in the content, materials, and methods of science teaching.

3. It has become clear that the effect of those innovations in both countries is very dependent on the quality of in-service teacher education that can be provided.

4. Current trends indicate that the emphasis in science teaching of the future will be on man and his environment, the relationships between science and society, and the teaching of moral values through science.

5. This emphasis is reasonable since science is an integral part of the experience of the child and the culture.

6. Therefore, in planning for science-teaching reform in the elementary school we should take an integrated or unified point of view, which will include the study of man and his environment, and the relationship between science and society.[1]

Considering these points and the generalist nature of the preservice training of the majority of elementary teachers in both countries, it became apparent that the real theme of the conference was teaching and learning in relation to young children. Research indicates that learning and therefore

the teaching of young children needs to be related to their everyday lives and experiences. Therefore, cultural and societal differences between the United States and Japan had to be an important consideration of the seminar's deliberations. The lack of total understanding of each other's culture and society, and the language problems between participants made the work of the conference difficult. These difficulties had a positive effect in that, while conscious of these problems, individuals tended to take little for granted and carefully explained with examples a point that might be accepted but not really understood by all present at a similar meeting of only United States or Japanese science educators.

During the week it became clear that in trying to present a point of view or idea to the participants from the other country, members of one country's delegation were for the first time coming to grips with the scope and complexity of topics frequently glossed over because understanding is assumed.

While considering these general points of view, the body of this paper will focus on the major topics of the conference, which were:

1. Current accomplishments and problems of in-service education for teachers of elementary-school science in the United States and Japan.

2. Nature of program innovation and its relationship to in-service education in Japan and the United States.

Current Accomplishments and Problems of In-Service Education for Teachers of Elementary School Science in the United States and Japan

Prime responsibility for the in-service training in science of elementary

teachers in Japan rests with the science education centers. There is a center in each prefecture and some large prefectures have additional local centers affiliated to the prefectural one. From our visits to the Kyoto, Osaka, and Tokyo centers and the presentations and discussions of the conference, it is clear these centers serve a valuable but limited purpose. They provide in-service courses ranging from a few meetings to year-long programs, but because of staff limitations and other constraints are only able to reach a small number of the teachers in the field. For example, between 1962 and 1974 the Osaka Prefecture science center was able to provide training for about 2300 elementary teachers out of a total teaching force of 28,000.[2] It is hoped that those who had such training will become lead teachers in the schools and help others with their science teaching. The planning for this, however, is left to the local schools and therefore is not consistent. Some prefectural centers are exploring the training of science teaching specialists but this approach runs into the same kinds of questions that are raised about specialist teaching in the elementary schools in the United States.

Since people need to be selected for the science-center courses, the opportunities tend to become available to those teachers interested in, and somewhat competent at science teaching.

From our observations in Kyoto, Osaka, and Tokyo and the report of Mr. Otohiko Ushiku, head of the Science Education Centers Association in Japan, the kind of courses offered for elementary teachers are very science

content oriented. Mr. Ushiku described the emphasis of the courses as follows:

> The technique of doing experiments and making observations should be looked upon as important. The teachers of elementary schools know about experiments and observations as book knowledge, but many of them don't have correct techniques for handling microscopes, and don't know the names of plants, rocks, and minerals, the manner of chemical experiments, the operation of electric circuits, and the earth sciences (astronomy, weather, geology). This is because they don't have any experience in carrying out experiments and observations by themselves. The ability to do correct experiments and observations is most necessary to teaching science, and it seems that elementary school teachers are lacking in this ability. As mentioned above, the content of the in-service training is the correct technique of doing experiments and making observations.[3]

From this description, our observations in the centers, and the discussions with the Japanese participants, it became apparent that the kind of in-service training offered is heavily oriented towards science content but presents it in a laboratory setting. That is, the purpose of the course is to study various topics in science (weather, electricity, etc.) and the method of presentation is lectures, demonstrations, and related laboratory exercises. In many ways the approach is similar to many of the extension and summer school courses currently available in the United States, and the whole approach seemed very similar to the teachers' summer institutes of the 1960's sponsored by the National Science Foundation and others in the United States. For the science-prone teacher, such training can be very valuable especially if the subject area (weather, electricity) chosen is one of interest to the teacher. One problem is that these courses are currently

set up in the Japanese science centers in such a way that they only reach a small number of teachers. More important for the great majority of elementary teachers in both Japan and the United States, such training on a short-term level only seems to convince teachers that they are inadequate and science is confusing, complex, and full of facts. Therefore the "safe" way to teach science is to lecture and emphasize facts with demonstrations and laboratory work used to reinforce the approach.

Dr. Hisao Morikawa, head of the Biology Section of the National Institute for Educational Research, discussed the problem of "science phobes," a large proportion of elementary teachers he described as teachers who, more interested in other subjects, dislike or even hate science without ever experiencing teaching it. As he stated, "It may be unsuccessful for these science-phobes to learn systematic but complicated knowledge of science or to study difficult laboratory techniques. It might promote, I am afraid, their dislike towards science and science teaching."[4]

After discussing the importance of teachers themselves becoming interested in and willing to study science, Dr. Morikawa stated the simple but often forgotten principle that if teachers want to help children like science, the teachers themselves must like science. As a possible solution to the problem, Dr. Morikawa presented the approach of teachers and schools having their own research interests in science and science teaching which they would investigate through their ongoing teaching experience. Essentially the approach is that teachers in a given school, either because

they are chosen as a pilot school or decide themselves to participate in a project, begin to study an aspect of science teaching of interest to them and of importance to the school. It may be new teaching materials or approaches, laboratory kits and visual aids, etc. Sometimes the activities include developing new materials for the school. In each case, teams of teachers work together, observe the use of the new or adapted materials, and finally present the results of their findings to their colleagues and the public. From an example described by Dr. Morikawa and the discussion that evolved it became clear this is a very valuable approach going on in Japan. In the limited number of schools where it is taking place it is helping to build real teacher leadership and independence. Many of the approaches in this plan are similar to the best cooperative projects between school districts and colleges in the United States used to train teachers to implement the new science programs recently developed in the United States. Most of these institutes in the U.S. were, however, short term and externally funded (primarily NSF). The Japanese work is ongoing and is funded by the local school authorities.

Two interesting points that came up in the discussion were, why didn't the Japanese science education centers give more leadership to these kinds of teacher research-oriented projects instead of the formal courses, and why didn't schools and colleges in the United States develop (with or without support) longer-term working agreements. In each case, lack of funds was given as the reason, and although true to some extent, a number of the

participants from both countries felt there were other factors more related to the whole approach to in-service education in both countries. Apparently the greatest success with in-service education in both countries comes about when teachers are helped to gain confidence and understanding by actually working in science and science teaching by themselves and with students. It is best when the topics are directly related to what the participant is expected to teach.

The overriding problem in both countries is the fact that the available in-service training is reaching only a very small percentage of the practicing teachers. Needed are new and innovative ways to reach and significantly affect a larger percentage of the teachers in the field. The Japanese participants were very interested in and impressed with the more recent National Science Foundation supported program of projects and institutes to disseminate ideas about and assist in the implementation of new curriculum projects and approaches. It was felt that such projects with a specific purpose or interest to the teacher had high promise of success, especially if the teachers were involved in making the choice on which new materials to implement in the school or system. The Japanese were surprised the program would not be operating in 1976 and the American participants were, needless to say, unable to adequately explain or justify the end of such programs.

Nature of Program Innovation and Its Relationship to In-Service Education in Japan and the United States

The national Ministry of Education is responsible for determining the

curriculum and when it will change in Japan. At first this seems completely different from the United States because of our commitment to local and state control of education. When one looks at the Japanese situation more closely it becomes apparent that there are great similarities between the operation of the Ministry of Education in Japan and the State Department of Education in California for example.

Currently Japan is working on a revision of the elementary-science program, and as described by Mr. Shigekazu Takemura, Senior Specialist in Science Education at the Ministry, guidelines are developed for the elementary science program which indicate topics, major ideas, and expected outcomes. Schematically these can be represented by the X's in Figure 1.

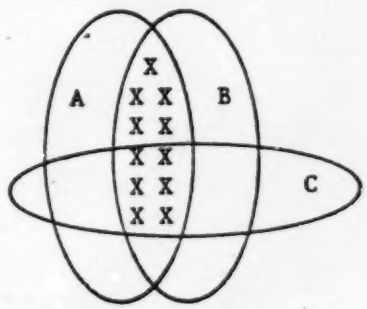

Figure 1. Representation of topics included in new Japanese elementary science program.

When the guidelines are accepted, commercial publishers are invited to produce programs that meet the guidelines for sale to the schools. As described in the diagram above, A or B, which include the recommended guidelines but also go off in other directions, would be acceptable while C, which ignores much of the guidelines to take a different emphasis, would be unacceptable. Programs produced (currently textbooks) by publishers are

reviewed by the Ministry and those approved as meeting the guidelines can be adopted by the various prefectures. Some prefectures use only one text while others will authorize a number of different ones so schools can make their own choices. Looked at from this point of view the situation is not very different from the United States where many states, cities, and large school districts develop their own frameworks or guidelines and then adopt commercially available programs that tend to meet those guidelines.

California, for example, sets up a framework for elementary science and then reviews textbooks and programs of various publishers, certifying those that meet the guidelines and can be adopted by local schools and districts. From the discussions during the conference, it is clear that the single centralized Ministry of Education in Japan exerts considerably more control than the usual state, city, or local school-system curriculum committee. The diversity of programs available for science education in the United States is much higher. This, however, does not change the fundamental fact that once the decision is made and a program is adopted for a school, school system, city or prefecture, the question of teacher training becomes a major one.

The new program tends to be external and somewhat foreign to the teachers who are expected to use it. That is, for reasons of economics, time, talent, and tradition, the teachers in a local school are usually not the ones who developed the program they are expected to teach. There is a need for in-service training in relation to the new program. Too often

this training is perfunctory and short term and the new program is not as successful as could be expected. Needed in both countries is a plan for introducing the teachers to a new program and helping them get started teaching it. Concurrently the necessary inputs to encourage the teachers to internalize the program and make it an actual part of their teaching approach should be provided.

In looking for ways to accomplish this objective, the conference discussed the role the Japanese science centers could play in regard to this need. The current emphasis in the Centers' courses, and their ability to reach only a small percentage of the teaching staff indicates they could not currently handle the task. In the United States the colleges and universities that provide most of the in-service training cannot completely meet this need through their regular courses because students come from many schools using different programs and so a course can't emphasize only one program. For these reasons some kind of cooperative institutes with long-term follow through similar to those sponsored on a limited scale by the National Science Foundation in the United States were considered a step in the right direction. The important ingredients are school-system and training-institution cooperation and the emphasis on the needs of teachers in the school or system who are about to begin using a new program. The consensus of the conference was that:

1. Innovation and change in the kind of science programs available in the elementary schools in both countries is wanted.

2. Plans for curriculum development and change have to be accompanied by carefully developed plans for the dissemination of information about the programs and the training of teachers to use and understand the programs.

Summary and Recommendations

The differences between the Japanese and American cultures, societies, and educational systems are great. At times language difficulties impeded the progress of the conference. Because few U.S. - Japan seminars or other meetings on science teaching, especially at the elementary level, have taken place, this meeting had to find its way and to some extent define what each group meant by descriptors of its system. For example, it was important for me to realize that the Japanese approach to centralized education is more like our state or local adoption procedures than the single-syllabus, single-program focus of central control found in many other countries. There are many similar problems and concerns in Japan and the United States regarding the purposes of science education and the need for developing a scientifically literate public in a technological society.

I feel certain that further bi-national seminars on science education and teacher training especially at the elementary-school level would be very valuable. Both countries face the similar problems of large numbers of untrained (in science) teachers and the desire in both countries to develop new and innovative science programs for the elementary schools. In addition both countries are concerned about the use of the mass media (television especially) for in-service education. Studies in regard to mass media are

being carried out in both countries. The Japanese encouragement of research on teaching by groups of teachers while they work in their local schools is an interesting innovation and worthy of further study. In some ways it parallels the APEX program[5] for pre- and in-service training of teachers described by its director, Frank Watson of the University of Vermont and also the USMES project [6] presented by its director, Dr. Earle Lomon of the Educational Development Center.

Another important area of future collaboration and exchange of ideas is the question of how to develop individuals in the school leadership, who will give direction and support to the science program. Both countries are exploring various approaches to this question and could benefit significantly by a more thorough exchange of ideas on this topic. Considering the fact that the number of participants from each country is limited in these seminars, I think it would be important to narrow considerably the scope of future seminars. Invitations to each seminar could then be restricted to actual practitioners in the specific field of concern of that seminar. This would allow for the constituting of working groups before the seminars. By the exchange of papers, thoughts, and descriptions of current work the individuals could arrive ready to attack and discuss clearly identified problems and interests in sub-groups and/or the seminar as a whole. Considering the relatively total lack of understanding of Japanese by most Americans and the difficulty many Japanese have in speaking English, full simultaneous translation of all seminar sessions into both languages should be a supported part of the plans for such seminars.

Since education is so much a part of the general life of the people in both countries, it is important that each participant be able to speak in the language in which he or she expresses ideas best.

Finally, as United States coordinator I want to speak of the outstanding help and cooperation I received from the Japanese coordinator, Professor Suteo Goto, dean of the School of Education, Tokyo Gakugei University and from Dr. Ebert Ashby, NSF representative in Tokyo. The graciousness and hospitality of our Japanese hosts to the American delegation and the members of their families who accompanied them will long be remembered by all of us. Many professional relationships were started or reinforced by the conference and I personally believe all attending came away with the feeling that a significant amount had been accomplished in spite of certain difficulties which are always a part of such international meetings.

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